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RESEARCH ARTICLE

Patterns of Communicable and Non-Communicable Diseases in Pilgrims during Hajj

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ABSTRACT:

Introduction: Hajj is the largest annual gatherings in Islamic world. Hajj pilgrims encounter a great deal of tough physical and mental stress. Overcrowding, extreme temperatures and electrolytes imbalance is common among pilgrims. These factors trigger the increased risk for communicable and non-communicable disease. **Objective**: The main objective of this study was to determine the patterns of common health problems (CHPs) encountered by pilgrims. **Methods**: CINAHL, EBSCO Host, PubMed, Google Scholar and Science Direct databases were used to search for articles related to the CHPs faced by the pilgrims which were published from 1998 to 2013. Eligible articles included non-experimental, experimental studies and case reports. The patterns and types of illness among pilgrims have been explored from limited intervention based articles. Only 27 studies were included encompassing with 17, 753 respondents out of 500 articles. **Results**: The analysis revealed that respiratory diseases (76.2%) were the leading health problems among Hajj-pilgrims followed by skin disease (7.4%), meningococcal disease (3.7%) and heat stroke (3.7%). **Conclusion**: Respiratory diseases are the most common health problems encountered by Hajj-pilgrims in which influenza gave the highest percentage. However, a definitive conclusion could not be drawn due to lack of existing studies related to this area. The existing evidence was insufficient to support the patterns of illness during mass gathering. Therefore, more studies are advocated to report the incidence of respiratory disease among Hajj-pilgrims.

KEYWORDS: Hajj, Common Health Problem, Pilgrims.

INTRODUCTION:

Hajj is the largest annual Muslim mass gatherings for religious and rituals performances which are performed in Mecca, Kingdom of Saudi Arabia (KSA). Every year, more than 2.5 million Muslims from different parts of the world perform Hajj [1]. The total number of pilgrims for 2011 was 2,927,717 which were increased in about 5% from the previous year. It has been reported at least 1,828 195 pilgrims were foreign visitors while 1,099,522 pilgrims came from KSA [2]. The Hajj is performed in the month of Dhu al-Hijjah which is twelfth and final month of the

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Islamic calendar [3]. Hajj is fifth and final pillars of Islam and obligatory for all adult who fulfill the prerequisite [4].
The Hajj-pilgrims need to travel and relocate a number of times [5]. Since the Hajj performance follows the Islamic lunar calendar and which is shorter than Gregorian calendar. The date of Hajj will be 10 or 11 days earlier than previous year which requires attention of health policy planner [6]. The Hajj pilgrims from various countries arrive in KSA has been steadily increasing every year [2, 7]. The Hajj congregations obviously become overcrowded and are a major public health challenges [8].

The recorded temperature during Hajj ranged between 37°C to 45°C [9]. Overcrowding and hot climate were major causes of health hazards among hajjis. Hajj-pilgrims encounter a great deal of tough physical and mental stress. Hajjis face multiple health issue like extreme temperatures, intravascular volume and electrolytes disturbances which also increases the risk of communicable and non-communicable diseases [10]. The current diseases spotted during performing Hajj including upper respiratory tract infections (URTI), diarrhea, heat stroke, dehydration or electrolyte imbalance[11]. One in three pilgrims will experience such respiratory symptoms [12]. In addition, the close contact and overcrowding aggravate the spread of infection especially URTI especially elderly[13].

URTI were reported among the most common cause of illness among Iranian pilgrims[14]. Other hazards include stampedes, traffic accidents and fire injuries[15]. The aim of this study was to determine the pattern of CHPs encountered by Hajj-pilgrims by reviewing previous studies. The result could be beneficial in planning and designing the appropriate prevention on pattern diseases in community Hajj pilgrims.

MATERIALS AND METHODS:

Search Strategy and Selection Criteria

EBSCO Host, PubMed, Medline, Google Scholar, Science Direct and Springer Link were used to search for articles published related to health problems from 1998 to 2012. The combinations of specific keywords were utilized to retrieve the articles: (pilgrims, Hajj, health problem and pattern). Only twenty seven had met the specific inclusion criteria: the subjects were Hajj-pilgrims; the type of study was experimental or non-experimental study; available full article in English. The outcome of studies was subsequently based on most CHPs encountered by Hajj-pilgrims.

Data Collection and Analysis

Demographic distributions of all respondents in the studies chosen were well summarized according to author, year and mean age, meanwhile the subsequent information gathered were sample size, study design, pattern of health problems, result and comment (Table 1). All the information from selected articles was tabulated into those tables.

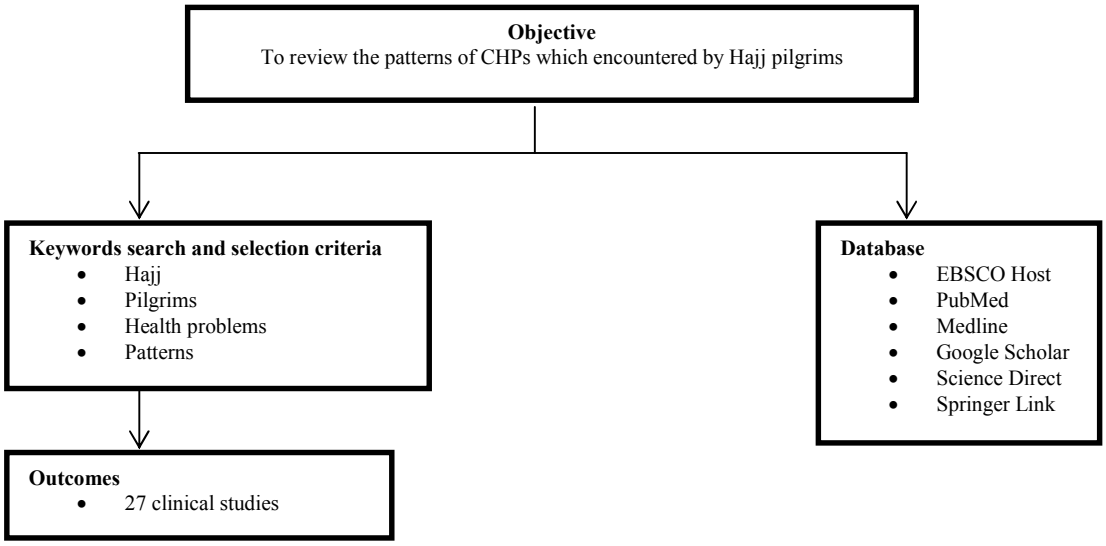

Figure 1: The Flow of Articles Selection

Table 1: Experimental Studies Based on Pattern of Common Health Problem during Hajj

Author/ (year)	Objectives, Method, and Sample Size (n)	Result
Alzahrani et al. (2012)	Pattern of diseases among pilgrims seeking medical services. Descriptive study. (n = 4136)	Respiratory diseases (60.8%), musculoskeletal (17.6%), skin (15.0%) gastrointestinal (13.1%)
Mandourah et al. (2012)	An account of pneumonia –related critical illness among hospitals providing medical care to Hajj pilgrims. Prospective cohort study. (n = 452)	Pneumonia was the primary cause of critical illness in 123 (27.2%)
Memish et al. (2012)	The prevalence of different respiratory viruses among healthcare worker. Cross-sectional study. (n = 184)	Two types of viruses were detected : rhinoviruses and Coronaviruses 229E
Moattari et al. (2012)	The attack rate of seasonal and pandemic influenza among returning Iranian pilgrims after the 2009 Hajj. Cross-sectional study. (n = 275)	9.1% pilgrims had influenza
Ziad et al. (2012)	Pilgrims' attendance at the Hajj was associated with an increase of acquiring influenza. Cross-sectional study. (n = 519)	Influenza A was 0.1-0.2% among the pilgrims
Ziyaeyan et al. (2012)	Prevalence of A (H1N1) among returning Iranian pilgrims. Cross-sectional study. (n = 305)	Influenza A (1.6%)
Asghar et al. (2011)	Common causes of bacterial pneumonia during the 2005 Hajj season and to relate the findings with clinical conditions. Cross-sectional study. (n = 141)	Clinically suspected pneumonia 53.9% were confirmed positive.
Mimish et al. (2011)	Electrocardiographic changes in exposed to high outdoor temperature with heat stroke and heat exhaustion. Case control study. (n = 62)	Sinus tachycardia and ischemic changes.
Mirza et al. (2011)	Predictors of asthma exacerbations during the Hajj. Cohort study. (n = 58)	There were 31-46.6% suffered from mild to moderate asthma attack
Alborzi et al. (2009)	Incidence of the common respiratory viruses among Iranian pilgrims. Cross-sectional study. (n = 255)	Viral agents (25%) of nasal specimens
Rashid et al. (2008)	Burden of influenza and RSV in asymptomatic British pilgrims during Hajj. Cross-sectional study. (n = 202)	Influenza or RSV with 18%
Rashid et al. (2008)	Rates of influenza virus, rhinovirus, RSV, hMPV, adenovirus, and parainfluenza virus infection among UK and Saudi pilgrims. Comparative study. (n = 260)	25% UK and Saudi pilgrims
Shakir et al. (2006)	Pattern of patients attending the Out Patient Department (OPD) during the Hajjseason. Descriptive study. (n= 3876)	Respiratory disease 41%
Wilder-Smith et al. (2005)	Risk of *M. Tuberculosis* infection among Hajj pilgrims. Prospective study. (n = 357)	Hajjis were 41.7% negative and 42.6% positive
Al-Ghamdi et al. (2003)	Pattern of admission during mild weather. Prospective study. (n = 160)	Respiratory diseases 57%, 19.4%, and GIT 6.3%
Bulkhy et al. (2003)	Serogroup of the locally circulating starins of *N.meningitis*. Longitudinal study. (n = 327)	Serogroup W135 40% of all recovered pre-Hajj
Wilder-Smith et al. (2003)	Incidence of pertussis among adult Hajj pilgrims. Prospective study. (n = 358)	Acquired pertussis1.4%
Fatani et al. (2002)	Aetiology of primary and secondary pyoderma. Prospective study. (n = 80)	Pyoderma patient 52.5%
Fatani et al. (2000)	Common skin disease seen in a 15-day period (Hajj pilgrims). Retrospective study. (n= 731)	Dermatitis 23.6%
Yousuf et al. (1999)	Prevalence of respiratory diseases among admitted Hajj pilgrims. Retrospective study. (n = 798)	Respiratory diseases 55%
El-Sheikh et al. (1998)	Incidence and type of RTI-causing bacteria and viruses during a period of epidemic infections. Prospective study. (n = 1156)	*Klebsiellapneumoniae* 15.1%, *Haemophilus influenzae* and *Streptococcus pneumoniae* 12.3%
Fasihuddin et al. (2006)	Aetiology, clinical features and the outcomes. Cross-sectional (n = 81)	Gram-negative bacilli were identified as causative organism in 21%, *Streptococcus pneumoniae* in 9.9%, *Mycobacterium tuberculosis* in 3.7%

Table 2: Non-Experimental Studies Based on Pattern of Common Health Problem during Hajj

Author/(Year)	Objectives, Method, and Sample Size (n)	Result
Saeed et al. (2012)	The prevalence of three symptoms of interest diarrhoea, acute respiratory infection and jaundice. Cross- sectional study. (n = 1659)	Acute respiratory infection 1.4% at pre-transit to 4% at transit area and 37% during Hajj
Zakuan et al. (2010)	The association between pre-morbid conditions and influenza like illness (ILI) among Hajj pilgrims. Cross-sectional study. (n = 276)	Underlying asthma was significantly associated with severe ILI
Al-Asmary et al. (2007)	The prevalence of acute respiratory tract infection (ARI) among personnel serving during Hajj. Case-control study. (n = 250)	The attack rate for acute respiratory infection 25.6%
Gautret et al. (2008)	The incidence of febrile cough among adult Muslim during Hajj. Prospective epidemiology study. (n = 580)	Diabetes mellitus 22.8%, Hypertension 25.3
Gautret et al. (2007)	Investigate prospectively the occurrence of common health hazard in French pilgrims during Hajj 2007. Prospective cohort study. (n = 545)	Cough 51%, followed by headache, heat stress, and fever

RESULTS:

A total of 27 studies related to patterns of CHPs which encountered by Hajj-pilgrims meeting the specific inclusion criteria for this study were used for analysis from 1998 to 2012. The majority of related articles were published in different prestigious journals around the world. The studies were carried in KSA (55.5%), Iran (11.1%), Singapore (7.4%), France (7.4%), United Kingdom (UK) (7.4%), Malaysia (3.7%), Afghanistan (3.7%) and Pakistan (3.7%).

Demographic Characteristics of Hajj Pilgrims

The total number of subjects based on the selected articles published starting from year 1998 until 2012 is 17, 753. Hajis' age was from 18 to 99 years old. Older Hajjis were in high risk group to be infected early because of weak immune systems. Eighteen out of 27 studies had highlighted that the increased rate of CHPs encountered was predominant by males (65%) pilgrims compared to females (35%). However, it is reported that pertussis involved a huge number of female Hajjis with 64% [16]. Nevertheless, the distribution of the pilgrim's gender was not documented in two of the selected articles [13, 17]. The nationality of the respondents was dominated by KSA national as most of the studies were carried out in KSA. Since the majority of articles were focused on Hajj-pilgrims; healthcare worker and medical mission personnel also have been included as a subject in two related articles as well [18-19].

Study Design and Method

Regarding the study design of the selected articles; most of the studies were based on cross-sectional studies (40.7%), followed by prospective studies (25.9%), retrospectives (7.4%), descriptive (7.4%), case control (7.4%), comparative (3.7%), cohort (3.7%) and longitudinal (3.7%). Various kinds of instruments were used in the quantitative studies. Majority of the studies performed the laboratory tests in order to evaluate the disease conditions of CHPs among Hajj-pilgrims. Sputum culture and X-rays were listed as the basic tests to detect the variety of bacteria isolated. Five studies used questionnaires as a tool to investigate the occurrences of CHPs among pilgrims.

Health Problems

Out of 27 selected studies, 22 of articles had concluded that respiratory diseases (76.2%) were the main CHPs encountered by Hajj-pilgrims and main reason for hospital admission (Table 1 and 2). Respiratory diseases are listed includes: pneumonia, influenza, chronic obstructive pulmonary disease (COPD), URTI and bronchial asthma [3, 13, 16, 17, 20]. Four articles had revealed that pneumonia being the most frequent disease recorded in their studies. In regards to causative organism for pneumonia, *Haemophilus influenza* (20.3%) was the common frequent organism isolated in sputum culture followed by *Klebsiella pneumonia* (17.6%), *Streptococcus pneumonia* (16.2%) and *Staphylococcus aureus* (9.5%) [10, 13, 21-22].

Regarding viral respiratory infection, 7 articles had identified viral respiratory infections as the second leading patterns cause of CHPs encountered by Hajj-pilgrims. Influenza, rhinovirus adenovirus and syncytial virus were commonly encountered [13, 23-26]. Immunofluorescence and monoclonal antibodies test were used to determine the causative agent.

One study reported about the outbreak of *Neisseria meningitidis* serogroup W135 in 2000 [27]. Another study [28] conducted among Hajjis revealed that there is the high risk of pulmonary tuberculosis (PTB) and 10% of them had a significant rise in MTB titre. Three articles had revealed the pattern of common admission to hospitals [3, 29-30]. The similar finding which had been discussed in those articles where respiratory diseases were recorded as most CHPs during Hajj performances. Besides, those articles had highlighted similar findings which stated that problems related to genitourinary, musculoskeletal and cardiovascular systems were revealed as the second most CHPs encountered by pilgrims after respiratory diseases [3, 29-30]. Lastly, two studies had focused on the incidence of skin diseases among pilgrims while only in one study where the health problem as related to heat stroke and heat exhaustion patterns [31-33].

DISCUSSION:

This brief review is intended to provide a structured analysis of published articles on patterns of health problems over the past twenty years with regards to Hajj pilgrim. Patterns of health problems, challenges for pilgrims during pilgrimage, related outcomes and suggestions for future investigators are highlighted.

The overall assessment had shown that more than 55.5% of the studies were carried out in KSA hospitals. It was reported that from the total number of pilgrims for 2011; at least 1.8 million were foreign visitors, while 1.1 million came from within KSA herself [34]. The percentage of both gender showed a great clear difference; male (65%) and females (35%). Men are usually responsible for taking great care of their family since they were physically fit and tough pilgrims. Majority of women or elderly pilgrims will assign men pilgrims during *ramī aj-jamarāt* (The Stoning of the Devil) rituals performance. All these factors actually could explain the higher proportion of males sufferings compared to females [29].

In terms of age, all ages were involved in this review and the pilgrims aged fifty years old and above were mostly affected. In general, elderly pilgrims were susceptible to get the infection due to decrease immune responses and aggravated by other factors such as exertions, lack of sleep and disturbances in dietary schedule [5, 11]. According to WHO, pneumococcal disease affects people of all ages, but children younger than five years and adults age 65 years and above were at increased risk because the immune system of the individuals at this age starts to decline [35].

Pattern of CHPs

Respiratory Tract Infections

URTIs were considered as the predominant CHPs which encountered by Hajj-pilgrims. URTIs are common illness in

of KSA and also hospital admission. URTIs continues to be the increasing burden of diseases among Hajj-pilgrims but there is still lack of studies being conducted to overcome these problems [36].

Pneumonia is a common and potentially life-threatening illness which is categorized as one of the major global health problems particularly among elderly group who perform [37]. Researchers had implemented a prospective study in two different hospitals during Hajj where had identified respiratory diseases as the most common cause of hospital admission (57%), with pneumonia being the leading reason for hospitalisation (39%) [3]. The factor listed among pneumonia patients during Hajj were community acquired pneumonia (CAP) (66.7%), aspiration-related (25%), tuberculosis (4.9%) and nosocomial (3.3%) [10].

CAP is one of the most common infectious diseases which are addressed by clinicians causing mortality and morbidity worldwide. In United States, CAP was classified as fifth leading cause of death especially older people aged 65 years and above [38]. The overall mortality rate among pilgrims with pneumonia during Hajj period was 14.8% which is similar to the mortality rates in West. Gram-negative bacilli were identified as the common causative agents for pneumonia with 21% followed by *Streptococcus pneumoniae* in 9.9% and *Mycobacterium tuberculosis* [21].

Viral respiratory tract infections particularly with influenza were indicated as another CHPs [39]. The studies reflected 50% was influenza B, 24.1% was herpes simplex virus, 12.9% was respiratory syncytial virus (RSV), and 5.6% was influenza A [40]. It also had been supported by the studies with similar findings of viral pathogens with influenza A and adenovirus being the most common [13].

The studies conducted by researchers which involves approximately 205 patients using real-time polymerase chain reaction (RT-PCR) revealed that influenza A give 56.7% (21/37) of the confirmed cases, RSV with 24% and influenza B with 18.9% [24]. The government of KSA recommend influenza vaccine to all hajjis especially with predisposing diseases and ages 65 years or above. Recent analysis regarding UK pilgrims demonstrated that the rate of influenza among vaccinated group (7%) was lower as compared to unvaccinated group (14%) respectively [26]. The KSA authority had recommended the use of facemask as to reduce the airborne transmission of diseases especially during Hajj.

The study conducted on Singaporean pilgrims was tested with a whole blood assay (QuantiFERON TB assay) in order to identify the immune response to tuberculosis (TB). The test was carried out before departure which involved approximately a total of 357 of pilgrims. A total of 149 of pilgrims were found to be negative [28]. Besides, the prevalence of Multi-Drug-Resistance (MDR) TB actually 3 times higher in KSA especially in cities of pilgrims such as Mecca, Medina and Jeddah [41].

The current swine flu virus (H1N1) pandemic was first recognized and reported in Mexico City in February 2009, which spread rapidly throughout the world. In 2009 Hajj season, WHO declared approximately 300,000 laboratory confirmed cases of H1N1 with 3,917 deaths in 191 different countries [42]. It is reported that low percentage of H1N1 prevalence among group of healthy pilgrims during the time of a declared (H1N1) pandemic. The result revealed the prevalence of pandemic H1N1 was 0.2% (n=1) among arriving pilgrims and 0.1% (n=2) among departing pilgrims [43].

Even though there is no original article reported about Middle East respiratory syndrome conronovirus (MERS-CoV) during Hajj performance, but it's still the latest biggest concerns especially for pilgrims when it's was first reported in 2012 [44]. MERS-CoV is a novel virus that was first isolated from a Jordan's patient, presenting with a severe acute respiratory infection in April 2012. WHO also reported two cases of severe community-acquired pneumonia caused by a novel human b-coronavirus, (MERS-CoV) in September 2012. Besides, total of 114 cases of laboratory-confirmed infection with MERS-CoV were reported in Middle East and Europe as well including 54 of total deaths was recorded[45].The exactly epidemiology of MERS-CoV is yet unknown including natural host and reservoir as well. Transmission seems to occur primarily among household contact and health care facilities based on an outbreak of 23 confirmed and 11 cases in four health care facilities which were reported in eastern province of Saudi Arabia during April and May 2013 [46].

Even though, WHO guarantees the risk of infection with MERS-CoV among pilgrims performing Hajj 2012 is very low, international community still concern about the possible potential for an outbreak. Until now, the cases which involved MERS-CoV were not reported during Hajj 2012, but the study from Marseillle, Hajj pilgrims from France showed a high rate of acquisition of other respiratory viruses [47]. WHO recommends adult aged 65 years and above, individual with chronic diseases and immunocompromised to postpone their plan for performing Hajj [48].

Meningococcal Disease

Meningococcal meningitis can be defined as an infection which is caused by the bacterium *Neisseria meningitidis*. The first international outbreak of *N. meningitidis* serogroup W135 was reported during 2000. The carriage rate was 4.7% of 327 samples of throat culture [27]. The tense environments like physically overcrowded, high humidity and dense air pollution have been reported to raise the carrier rates for meningococcal disease as high as 80% [49]. Saudi authority provides the best vaccines protection mandatory guideline such as quadrivalent polysaccharide vaccination (A,C,Y,W135) for the prevention of meningococcal disease for pilgrims and workers.

Skin Infections

Makkah is one of the hottest places in the world with the temperature range of 38 to 42°C. A bacterial skin infection is one of the CHPs during Hajj [32]. Study revealed that 80 pyoderma patients were reported during Hajj. Among pyoderma cases 52.5% were primary and 47.5% were secondary pyoderma. Impetigo was leading cause of primary pyoderma where *Staphlococcus aureus* responsible as main causative agents and followed by *Stretococcus pyogenes* [32]. Dermatitis (23.6%) was indicated as the most common skin diseases followed by pyoderma (11.2%), intertrigo (10.7%) and urticarial (5.7%) based on previous study with similar finding. Middle age group and elders may have contributed to a high incidence of intertrigo and fungal infections [31].

Environmental Heat Injury

The extremely high temperatures particularly in summer, radiated heat directly from sun, heat from vehicles and internal heat were determined as the main factor listed of heat stress [50]. The prolonged exposure towards high outdoor temperature can lead to heat exhaustion or heat stroke among pilgrims. One study about electrocardiographic finding in heat stroke and exhaustion reported that increase of heart rate is significantly attributed to the higher core temperature in heat stroke and heat exhaustion group [33].

Cardiovascular Diseases

Over the past few years, cardiovascular disease is an important cause of ICU and mortality rate particularly during Hajj [3, 51] Study revealed chronic obstructive pulmonary diseases (COPD) as the second leading cause of hospital admission during Hajj after pneumonia. This is supported by Saudi Statistic, 2005; cardiovascular disease is one the most common cause of death during Hajj performance with the percentage of 43% [52]. In 2004, myocardial infection was categorized as the major cause of hospital admissions specifically into CCU by seven different of hospitals in Makkaa ahead of pneumonia, asthma, COPD, and pulmonary oedema [11]. The physical stress may contribute as a main factor in precipitating IHD due to massive overcrowding during Hajj especially for those who had pre-existing cardiac disease history [5].

Despite the overall findings in this review, there were several drawbacks that need to be mentioned. First, the limited access online database which focused article published in English-language. Second, as highlighted earlier, since the majority of studies have been conducted in Saudi Arabia, our findings may not represent total Hajj pilgrims from different population. Besides, most of studies had focused on respiratory disease finding which gives a limitation for discover other health problems.

Despite of the limitations mentioned, this study found that respiratory diseases are the most CHPs encountered by Hajj pilgrims with influenza and pneumonia as the predominant infection. Acknowledge the pattern of common health especially during Hajj performance gives such important information either Saudi Arabia government or related countries authorities in providing health policy makers and health service towards pilgrims. Since elderly and immunocompromised pilgrims were susceptible to tend have an infection, the pilgrims' countries origin should be focused more on providing pre-departure vaccination and even free health service during Hajj performance. Vaccination also can be considered as the first step closer in preventing infectious diseases especially when more than 2 million of pilgrims will participate simultaneously in this mass gathering. Pilgrims remain in close proximity such in crowded tents or rooms for at least several days or weeks were the main course. The statistical analysis regarding the pattern of diseases will provide better management particularly for involving countries authorities. Plus, the optimal latest information regarding common health problem provides the best solution for medications intake and treatment management as well. Therefore, well designed prospective studies need to be conducted to safeguard Hajj-pilgrims.

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